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EXAMINER	
FLORES, LEON	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/675,215	MALTSEV ET AL.	
	Examiner	Art Unit	
	LEON FLORES	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/13/2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *15-21* is/are allowed.

6)☒ Claim(s) *1-5,7-14,22-25 and 27-30* is/are rejected.

7)☒ Claim(s) *6 and 26* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims (1-30) have been considered but are moot in view of the new ground(s) of rejection.

Response to Remarks

Applicant asserts that, *"Peeters does not disclose a recursive filter or the performance of recursive filtering. Recursive filtering uses an output of the filtering as one of the inputs".*

The examiner respectfully disagrees. One skilled in the art would know that the input of the filter is a function of the output (mathematically), thus making this filter a recursive filter.

Applicant further asserts that, *"Applicant's claim 1, however, distinguishes over Peeters by reciting that a predicted observation vector is generated from a phase compensation estimate for a prior data symbol using a recursive algorithm, and that the predicted observation vector is subtracted from the observation vector. This recursive process that modifies the observation vector is not taught by Peeters".*

The examiner agrees. However, a new ground of rejection has been issued.

Applicant finally asserts that, *"Regarding claims 6 and 26, Perets has been cited for disclosing a Kalman filter, however Perets fails to disclose recursive filtering using a priori information about a dynamic model of phase and a phase noise power value from a phase noise spectrum of transceiver oscillators. Perets uses the channel response, ICI and AWGN (see Perets section 2 lines 10 - 14). Accordingly, the combination of*

Kim, Peeters, and Perets does not result in Applicant's claim 6 and 26. One advantage to Applicant's claim 6 and 26, for example is that the phase noise of the receiver can be compensated for".

The examiner agrees.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims (1-5, 22, and 28-30) are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1) in view of Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), and further in view of Wright et al. (hereinafter Wright) (US Patent 5,990,738)

Re claim 1, Kim discloses a method comprising: applying the phase compensation estimate to channel equalized subcarriers of the data symbol in the

frequency domain after performance of a Fourier transform on the data symbol. (See fig. 1: 140, 150, 160, & paragraph 7)

But the reference of Kim fails to teach recursively filtering an observation vector formed by weighted pilot subcarriers of based on channel conditions for a data symbol of an orthogonal frequency division multiplexed (OFDM) packet from pilot subcarriers within the data symbol; and wherein the pilot subcarriers are weighted based on fading gains.

However, Peeters does. (See fig. 1 & col. 6, line 46 – col. 7, line 67) Peeters discloses generating a phase compensation estimate (In fig. 1: the input to ROTOR via the feedback) by recursively filtering an observation vector (In fig. 1, Te is passed through a filter "FIL" and CHANNEL.) formed by weighted pilot subcarriers of based on channel conditions (In fig. 1, the input to S are multiplied by WEIGHT) for a data symbol of an orthogonal frequency division multiplexed (OFDM) packet from pilot subcarriers within the data symbol (See col. 4, line 55 "multi-carrier receiver"). Furthermore, one skilled in the art would know that the input of the filter is a function of the output (mathematically), thus making this filter a recursive filter.

Taking the combined teachings of Kim and Peetes <u>as a whole</u>, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, in the manner as claimed and as taught by Peeters, for the benefit of achieving phase compensation.

The combination of Kim and Peeters discloses the limitations as claimed above, except they fails to explicitly teach that wherein the recursively filtering includes

generating a predicted observation vector from a phase compensation estimate generated for a prior data symbol using a recursive algorithm, and subtracting the predicted observation vector from the observation vector.

However, Wright does. (See fig. 14 & col. 23, line 58 – col. 24, line 14) Wright discloses that wherein the recursively filtering includes generating a predicted observation vector (18) from a phase compensation estimate generated for a prior data symbol using a recursive algorithm (“Kalman and extended Kalman algorithm), and subtracting the predicted observation vector from the observation vector. (145, ”difference”) Furthermore, this type of recursive algorithm is notoriously well known in the art, and it can be implemented using very well known prediction filters, such as kalman filters.

Taking the combined teachings of Kim, Peetes, and Wright as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, in the manner as claimed and as taught by Peeters, for the benefit of achieving phase compensation.

Re claim 2, the combination of Kim, Peetes, and Wright further discloses that wherein the phase compensation estimate is applied after channel equalization to the channel equalized subcarriers of the data symbol in the frequency domain prior to demapping the subcarriers, (In Kim, see fig. 1) wherein channel estimate used to channel equalize the subcarriers are determined from long training symbols of the OFDM packet. (It is notoriously well known in the art that in a OFDM system the long

training symbols does the channel estimation, as shown in US Patent 7,027,530 fig. 1 and col. 2, lines 63-65)

Re claim 3, the combination of Kim, Peetes, and Wright further discloses repeating generating and applying for subsequent data symbols of the OFDM packet, wherein the data symbol is comprised of a plurality of symbol modulated subcarriers, at least some of the symbol-modulated subcarriers of the plurality being the pilot subcarriers (In Peeters, see col. 11, lines 36-38), and wherein generating the phase compensation estimate comprises: weighting the pilot subcarriers based on fading gains for the pilot subcarriers (In Peeters, see fig. 1: CALC); combining the weighted pilot subcarriers in an observation vector former to generate the observation vector (In Peeters, see fig. 1: S); and recursively filtering the observation vector using a channel estimate to generate the phase compensation estimate. (In Peeters, see fig. 1: Te passes through a filter and is further multiplied by channel gains before being inputted to the ROTOR.)

Re claim 4, the combination of Kim, Peetes, and Wright further discloses that wherein repeating generating the phase compensation estimate comprises: combining the pilot subcarriers of a present data symbol to generate an observation vector for the present data symbol (In Peeters, see fig. 1: S); and performing recursive filtering on the observation vector for the present data symbol using the channel estimate to generate the phase compensation estimate for the present data symbol. (In Peeters, see fig. 1:

Te passes through a filter and is futher multiplied by channel gains before being inputted to the ROTOR.)

Re claim 5, the combination of Kim, Peetes, and Wright further discloses that wherein repeating generating the phase compensation estimates comprises: combining the pilot subcarriers of a present data symbol to generate an observation vector for the present data symbol (In Peeters, see fig. 1: S); and performing recursive filtering on the observation vector for the present data symbol to generate a frequency offset estimate and the phase compensation estimates for a next data symbol. (In Peeters, see fig. 1: Te passes through a filter and is futher multiplied by channel gains before being inputted to the ROTOR.)

Claim 22 is a system claim corresponding to method claim 1. Hence, the steps performed in method claim 22 would have necessitated the elements in system claim 22. Therefore, claim 22 has been analyzed and rejected w/r to claim 1 above.

Claim 28 has been analyzed and rejected w/r to claim 1 above.

Claim 29 has been analyzed and rejected w/r to claim 3 above.

Claim 30 has been analyzed and rejected w/r to claim 3 above.

1. Claims (10-11) are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1), Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), and Wright et al. (hereinafter Wright) (US Patent 5,990,738), as applied to claim 1 above, and further in view of Christos Komninakis et al (hereinafter Komninakis), "Multi-Input Multi-Output Fading Channel Tracking and Equalization Using Kalman Estimation", IEEE 2002.

Re claim 10, the combination of Kim, Peetes, and Wright fails to teach that wherein recursively filtering comprises: subtracting a predicted observation vector from the observation vector to generate a residual vector; multiplying the residual vector by a gain matrix to generate a residual gain vector; adding the residual gain vector to a linear prediction vector to generate an estimate vector; and extracting a frequency offset estimate and the phase compensation estimate for the data symbol from the estimate vector.

However, Komninakis does. (See section 3 "Kalman Tracking and Channel Prediction") Komninakis discloses that wherein recursively filtering comprises: subtracting a predicted observation vector from the observation vector to generate a residual vector (See equation 17, "e"); multiplying the residual vector by a gain matrix to generate a residual gain vector (See equation 17, "K"); adding the residual gain vector to a linear prediction vector to generate an estimate vector (See equation 17, "h"); and extracting a frequency offset estimate and the phase compensation estimate for the data symbol from the estimate vector. (See equation 17, "h". Furthermore, one skilled in the art would know that the channel estimate is capable of providing this information.)

Taking the combined teachings of Kim, Peeters, Wright, and Komninakis as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters and Wright, in the manner as claimed and as taught by Komninakis, for the benefit of estimating the channel.

Re claim 11, the combination of Kim, Peeters, Wright, and Komninakis further discloses that wherein the estimate vector is a multi-dimensional vector comprised of the frequency offset estimate and the phase compensation estimate (In Perets, see sections 3 & 4), and wherein the phase compensation estimate is applied to a data symbol subsequent to performing a Fast Fourier Transform (FFT) on the data symbol. (In Peeters, see fig. 1: ROTOR)

2. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1), Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), Wright et al. (hereinafter Wright) (US Patent 5,990,738), and Christos Komninakis et al (hereinafter Komninakis), "Multi-Input Multi-Output Fading Channel Tracking and Equalization Using Kalman Estimation", IEEE 2002., as applied to claim 10 above, and further in view of Crawford (US Publication 2002/0159533 A1).

Re claim 12, the combination of Kim, Peeters, Wright, and Komninakis further discloses wherein the estimate vector is a multi-dimensional vector comprised of a

frequency offset estimate and the phase compensation estimate (In Komninakis, see section 3 "Kalman Tracking and Channel Prediction". Furthermore, one skilled in the art would know that the channel estimate is capable of providing this information.).

But the combination of Kim, Peeters, Wright, and Komninakis fails to teach that the method further comprises rotating a phase of a serial symbol stream comprising the data symbol prior to performing a Fast Fourier Transform on the data symbol.

However, Crawford does. (See fig. 3) Crawford discloses a system for rotating the phase of the incoming signal prior to FFT processing.

Taking the combined teachings of Kim, Peeters, Wright, Komninakis, and Crawford as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters, Wright, and Komninakis, and as taught by Crawford, for the benefit phase rotating the incoming signal.

3. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1), Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), and Wright et al. (hereinafter Wright) (US Patent 5,990,738), as applied to claim 1 above, and further in view of McFarland et al. (hereinafter McFarland) (US Patent 7,027,530 B2)

Re claim 7, the combination of Kim, Peetes, and Wright fails to specifically disclose that wherein the channel estimate is generated from a long training symbol of the OFDM packet, and wherein the additive noise power estimate and the SNR

estimate are generated from short training symbols of the OFDM packet.

However, McFarland does. (See col. 2, lines 58-65) McFarland discloses an OFDM system that estimates and compensates for channel impairments. The system uses short training sequences for signal detection, an initial automatic gain control adjustment, diversity selection, coarse frequency offset estimation and timing synchronization. And two long training symbols for channel and fine frequency offset estimation.

Taking the combined teachings of Kim, Peeters, Wright, and McFarland as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters and Wright, in the manner as claimed and as taught by McFarland, for the benefit of optimizing/enhancing the communication link between the transmitter and receiver.

4. **Claims (8 & 27) are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1), Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), Wright et al. (hereinafter Wright) (US Patent 5,990,738), and McFarland et al. (hereinafter McFarland) (US Patent 7,027,530 B2), as applied to claim 7 above, and further in view of Crawford. (US Publication 2002/0159533 A1)**

Re claim 8, the combination of Kim, Peeters, Wright, and McFarland further discloses that wherein the OFDM packet is comprised of a plurality of sequential symbol modulated subcarriers, beginning with the short training symbols modulated on a

portion of the subcarriers followed by the long training symbol and a plurality of data symbols, the data symbols containing at least one known pilot subcarrier. (In McFarland, see fig. 1 & col. 2, lines 58-65)

But the combination of Kim, Peeters, Wright, and McFarland fails to disclose that wherein the channel estimate, the additive noise power estimate, the SNR estimate, and the phase noise power value are used substantially for data symbols of the OFDM packet.

However, Crawford does. (See fig. 2 & paragraphs 42-44) Crawford discloses that the channel estimate, the additive noise power estimate, the SNR estimate, and the phase noise power value are used substantially for data symbols of the OFDM packet.

Taking the combined teachings of Kim, Peeters, Wright, McFarland, and Crawford as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters, Wright, and McFarland, in the manner as claimed and as taught by Crawford, for the benefit of complying with the IEEE standards. (See paragraphs 42 & 44)

Claim 27 is a system claim corresponding to method claim 8. Hence, the steps performed in method claim 8 would have necessitated the elements in system claim 27. Therefore, claim 27 has been analyzed and rejected w/r to claim 8 above.

5. **Claims (9 & 25) are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1), Peeters et al. (hereinafter Peeters)**

(US Patent 6,628,738 B1), and Wright et al. (hereinafter Wright) (US Patent 5,990,738), as applied to claim 1 above, and further in view of Crawford. (US Publication 2002/0159533 A1)

Re claim 9, the combination of Kim, Peeters, and Wright fails to teach that wherein the method further comprises generating a channel estimate from long training symbols of the OFDM packet, and wherein weighting includes applying weights to pilot subcarriers, the weights being complex conjugates of the fading gains of the pilot subcarriers, the fading gains being determined from the channel estimate.

However, Crawford does. (See fig. 4 & paragraphs 48 & 53-54) Crawford discloses generating a channel estimate from long training symbols of the OFDM packet (See pargraph 48), and wherein weighting includes applying weights to pilot subcarriers, (See fig. 4 & paragraphs 48 & 54) the weights being complex conjugates of the fading gains of the pilot subcarriers, the fading gains being determined from the channel estimate. (See paragraphs 48 & 54)

Taking the combined teachings of Kim, Peeters, Wright, and Crawford <u>as a whole</u>, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters and Wright, in the manner as claimed and as taught by Crawford, for the benefit of achieving phase error compensation.

Claim 25 is a system claim corresponding to method claim 9. Hence, the steps performed in method claim 25 would have necessitated the elements in system claim 25. Therefore, claim 25 has been analyzed and rejected w/r to claim 9 above.

6. Claims (13 & 14) are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1), Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), and Wright et al. (hereinafter Wright) (US Patent 5,990,738), as applied to claim 1 above, and further in view of Kuwabara et al. (hereinafter Kuwabara) (US Publication 2001/0015954 A1) and Crawford. (US Publication 2002/0159533 A1)

Re claim 13, the combination of Kim, Peeters, and Wright further discloses performing a Fast Fourier Transform (FFT) on the plurality of parallel groups of time-domain samples that represent the data symbol to generate frequency domain symbol modulated subcarriers prior to applying the phase compensation estimate (In Peeters, see fig. 1: ROTOR); demapping the data symbol after channel equalization and after applying the phase compensation estimate to generate at least a portion of a decoded bit stream. (In Kim, see fig. 1)

Although this procedure is well known in the art, the combination of Kim, Peeters, and Wright fails to explicitly teach separating the pilot subcarriers from data subcarriers of the frequency domain symbol modulated subcarriers for use in generating the phase compensation estimate.

However, Kuwabara does. (See fig. 1 & paragraphs 35-37) Kuwabara disclose a receiver that separates the pilot from the data in order to compensate for the channel impairments.

Taking the combined teachings of Kim, Peeters, Wright, and Kuwabara as a whole, it would have been obvious to one of ordinary skills in the art to have

incorporated this feature into the system of Kim, as modified by Peeters and Wright, in the manner as claimed and as taught by Kuwabara, for the benefit of compensating for the channel impairments. (See paragraphs 35-37)

The combination of Kim, Peeters, Wright, and Kuwabara discloses the limitations as claimed above, except they do not explicitly teach that rotating a phase of a serial symbol stream comprising the data symbol prior to performing a Fast Fourier Transform on the data symbol, the rotating based at least on the frequency offset estimate.

However, Crawford does. (See fig. 3: 302, 304, 320 & paragraphs 47 & 52) Crawford discloses rotating a phase of a serial symbol stream comprising the data symbol prior to performing a Fast Fourier Transform on the data symbol, the rotating based at least on the frequency offset estimate.

Taking the combined teachings of Kim, Peeters, Wright, Kuwabara, and Crawford as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters, Wright, and Kuwabara, in the manner as claimed and as taught by Crawford, for the benefit of achieving de-rotation prior to the FFT. (See paragraph 52)

Re claim 14, the motivation for combining these references has already been established in claim 13 above, therefore, the combination of Kim, Peeters, Wright, Kuwabara, and Crawford further discloses that wherein the pilot subcarriers are comprised of modulated pilot symbols having known training values and modulated on a predetermined portion of subcarriers of the plurality. (In Crawford, see fig. 2 &

descriptions.)

7. Claims (23 & 24) are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1), Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), and Wright et al. (hereinafter Wright) (US Patent 5,990,738), as applied to claims 1 & 22 above, and further in view of Perets et al (hereinafter Perets), *"A New Phase and Frequency Offset Estimation Algorithm for OFDM Systems Applying Kalman Filter"*, Department of Electrical Engineering-Systems, Tel Aviv University, December 2002.

Re claim 23, the combination of Kim, Peeters, and Wright further discloses an observation vector former to combine and weight the pilot subcarriers to generate the observation vector. (In Peeters, see fig. 1)

But the combination of Kim, Peeters, and Wright fails to explicitly teach a recursive filter to recursively filter the observation vector to generate a frequency offset and the phase compensation estimates for phase compensating the data symbol.

However, Perets does. (See sections 3 & 4) Perets discloses a method for estimating the phase and frequency offset by using an extended Kalman filter algorithm. This algorithm estimates and tracks the phase and frequency offsets in an OFDM system.

Taking the combined teachings of Kim, Peeters, Wright, and Perets as a whole. It would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters and Wright, in the manner as

claimed and as taught by Perets, for the benefit of achieving fast convergence and good tracking ability. (See abstract)

Re claim 24, the combination of Kim, Peeters, Wright, and Perets further discloses that wherein the observation vector former includes a weighting element to weight the pilot subcarriers based on the fading gains for the pilot subcarriers prior to combining the weighted subcarriers in generating the observation vector. (In Peeters, see fig. 1)

2. Claims (1, 22, 28) are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (US Publication 2003/0063558 A1) in view of Peeters et al. (hereinafter Peeters) (US Patent 6,628,738 B1), and further in view of Christos Komninakis et al (hereinafter Komninakis), "Multi-Input Multi-Output Fading Channel Tracking and Equalization Using Kalman Estimation", IEEE 2002.

3. Re claim 1, Kim discloses a method comprising: applying the phase compensation estimate to channel equalized subcarriers of the data symbol in the frequency domain after performance of a Fourier transform on the data symbol. (See fig. 1: 140, 150, 160, & paragraph 7)

But the reference of Kim fails to teach recursively filtering an observation vector formed by weighted pilot subcarriers of based on channel conditions for a data symbol of an orthogonal frequency division multiplexed (OFDM) packet from pilot subcarriers within the data symbol; and wherein the pilot subcarriers are weighted based on fading

gains.

However, Peeters does. (See fig. 1 & col. 6, line 46 – col. 7, line 67) Peeters discloses generating a phase compensation estimate (In fig. 1: the input to ROTOR via the feedback) by recursively filtering an observation vector (In fig. 1, Te is passed through a filter "FIL" and CHANNEL.) formed by weighted pilot subcarriers of based on channel conditions (In fig. 1, the input to S are multiplied by WEIGHT) for a data symbol of an orthogonal frequency division multiplexed (OFDM) packet from pilot subcarriers within the data symbol (See col. 4, line 55 "multi-carrier receiver"). Furthermore, one skilled in the art would know that the input of the filter is a function of the output (mathematically), thus making this filter a recursive filter.

Taking the combined teachings of Kim and Peetes <u>as a whole</u>, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, in the manner as claimed and as taught by Peeters, for the benefit of achieving phase compensation.

The combination of Kim and Peeters discloses the limitations as claimed above, except they fails to explicitly teach that wherein the recursively filtering includes generating a predicted observation vector from a phase compensation estimate generated for a prior data symbol using a recursive algorithm, and subtracting the predicted observation vector from the observation vector.

However, Komninakis does. (See section 3 "Kalman Tracking and Channel Prediction") Komninakis discloses that that wherein the recursively filtering includes generating a predicted observation vector from a phase compensation estimate

generated for a prior data symbol using a recursive algorithm, and subtracting the predicted observation vector from the observation vector. (See equation 17) Furthermore, this type of recursive algorithm is notoriously well known in the art, and it can be implemented using very well known prediction filters, such as kalman filters.

Taking the combined teachings of Kim, Peeters, Wright, and Komninakis as a whole, it would have been obvious to one of ordinary skills in the art to have incorporated this feature into the system of Kim, as modified by Peeters and Wright, in the manner as claimed and as taught by Komninakis, for the benefit of estimating the channel.

Claim 22 is a system claim corresponding to method claim 1. Hence, the steps performed in method claim 22 would have necessitated the elements in system claim 22. Therefore, claim 22 has been analyzed and rejected w/r to claim 1 above.

Claim 28 has been analyzed and rejected w/r to claim 1 above.

Allowable Subject Matter

8. Claims (15-21) are allowed.

9. Claims (6 & 26) are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON FLORES whose telephone number is (571)270-1201. The examiner can normally be reached on Mon-Fri 7-5pm Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/L. F./
Examiner, Art Unit 2611
April 3, 2008

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611